Cisco ASR 901 Series Aggregation Services Router Hardware Installation Guide

December, 2012

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About This Guide

This section describes the objectives, audience, organization, and conventions of this hardware installation guide.

Note Use this document with the documents listed in the "Related Documentation" section on page ix.

This section contains the following topics:

- Document Revision History, page vii
- Objectives, page viii
- Audience, page viii
- Organization, page viii
- Conventions, page viii
- Safety Warnings, page ix
- Related Documentation, page ix
- Obtaining Documentation, Obtaining Support, and Security Guidelines, page x

Document Revision History

The Document Revision History table below records technical changes to this guide. The table shows the document revision number for the change, the date of the change, and a brief summary of the change. Not all Cisco documents use a Document Revision History table.

Revision	Date	Change Summary
OL-23778-01	October 2011	Initial version of the document.
OL-23778-01	February 2012	Updated T1/E1 Interface LEDs section in the Troubleshooting chapter.

Objectives

This guide explains how to install, maintain, and troubleshoot your router hardware.

It provides the minimum software configuration information. For the detailed configuration procedures, see the Cisco IOS configuration guide and command reference publications. For more information, see the "Obtaining Documentation, Obtaining Support, and Security Guidelines" section on page x.

Warranty, service, and support information is in the *Cisco Information Packet* that is shipped with your router.

Audience

This guide is designed for personnel who install, configure, and maintain the router. These persons should be familiar with electronic circuitry and wiring practices and be experienced electronic or electromechanical technicians. This guide identifies certain procedures that should be performed only by trained and qualified personnel.

Organization

Chapter	Title	Description
Chapter 1	Introduction	Describes the hardware features and specifications of the routers.
Chapter 2	Preparing to Install the Router	Describes safety recommendations, site requirements, network connection considerations, required tools and equipment, and provides the installation checklist.
Chapter 3	Installing the Cisco ASR 901 Mobile Wireless Router	Includes router installation information, and shows how to connect the router console/auxiliary port.
Appendix A	Troubleshooting	Describes how to isolate problems, read LEDs, interpret error and status messages, and recover software images.
Appendix B	Cable Specifications	Provides cable specifications to use if you plan to build your own cables.
Appendix C	Site Log	Provides example site log.

Conventions

Note Means *reader take note*.

Tip Means *the following information will help you solve a problem.*

Caution Means *reader be careful*. In this situation, you might perform an action that could result in equipment damage or loss of data.

Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, might harm you. A warning symbol precedes each warning statement. The safety warnings provide safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring. Warnings are translated into several languages. (For information about compliance guidelines and translated safety warnings, refer to *Cisco Regulatory Compliance and Safety Information for the Cisco ASR 901 Router*.

Warning **IMPORTANT SAFETY INSTRUCTIONS**

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

SAVE THESE INSTRUCTIONS

Related Documentation

For additional information about the Cisco ASR 901 router, refer to the following documents:

- *Cisco Regulatory Compliance and Safety Information for Cisco ASR 901 Series Aggregation Services Router*
- *Cisco ASR 901 Series Aggregation Services Router Software Configuration Guide*
- *Cisco ASR 901 Series Aggregation Services Router Command Reference*
- *Release Notes for Cisco ASR 901 Series Aggregation Services Router*

To access the related documentation on Cisco.com, go to:

http://www.cisco.com/en/US/partner/products/ps12077/tsd_products_support_series_home.html

Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, see the monthly *What's New* in Cisco Product Documentation, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

CHAPTER 1

Introduction

The Cisco ASR 901 Mobile Wireless Router is a cell site gateway platform specifically designed to provide transport for both legacy TDM and Ethernet traffic over a single converged network. The Cisco ASR 901 router is used at the cell site as a part of a 2G, 3G, or 4G radio access network (RAN) traffic.

This chapter includes the following sections:

- Hardware Description, page 1-1
- Power Supply, page 1-5
- System Specifications, page 1-7
- Router Interface Numbering, page 1-7
- Regulatory Compliance, page 1-8

Hardware Description

Contained in a standard shelf-rack enclosure, the Cisco ASR 901 router weighs approximately 10 pounds (4 kg). It measures 1.7 inches high x 17.4 inches wide x 8.25 inches deep (4.32 cm or 1RU x 44.2 cm x 21.0 cm). These dimensions do not include the rack-mount brackets.

You can mount the router in a standard (ETSI) 19-inch (48.3 cm) equipment rack or 600mm ETSI rack or a 23" ETSI rack.

The Cisco ASR 901 router includes the following hardware features:

- 16 T1/E1 RJ45 ports
- Four ports of 100/1000 Copper Ethernet including auto-MDIX (RJ45 connector)
- Four ports of SFP only
- Four combo ports (SFP/Copper)
- Dual feed supply with redundant DC inputs plus built in redundant power supply (RPS)
- Two fans placed in the chassis (fans are redundant)
- Chassis: 1RU, 8.25 inch depth
- Operating temperature range is -40 to +149°F (-40°C to +65°C).
- Side to side airflow
- Four solid state alarm inputs
- A single built-in 1GB Meninx Flash memory

- Two management ports: RS-232 serial console and 10/100 Base-T Ethernet ports
- One BITS clock port (RJ45) and 1 ToD port (RJ45)
- Two miniature coaxial connectors for 10Mhz and 1PPS timing (input or output). You can use these interfaces with an external GPS device to send or receive clocking from the router.
- Two LEDs for each T1/E1 port
  - C—indicates out of service or not configured, carrier condition, and loop condition
  - AL—no alarm, or alarm condition
- Two LEDs for each Ethernet port
  - L—indicates activity, lack of activity, or no link
  - S—indicates speed (100 or 1000) or off
- One System LED:
  - Solid Green—System Healthy (normal operation)
  - Solid RED—System Faulty

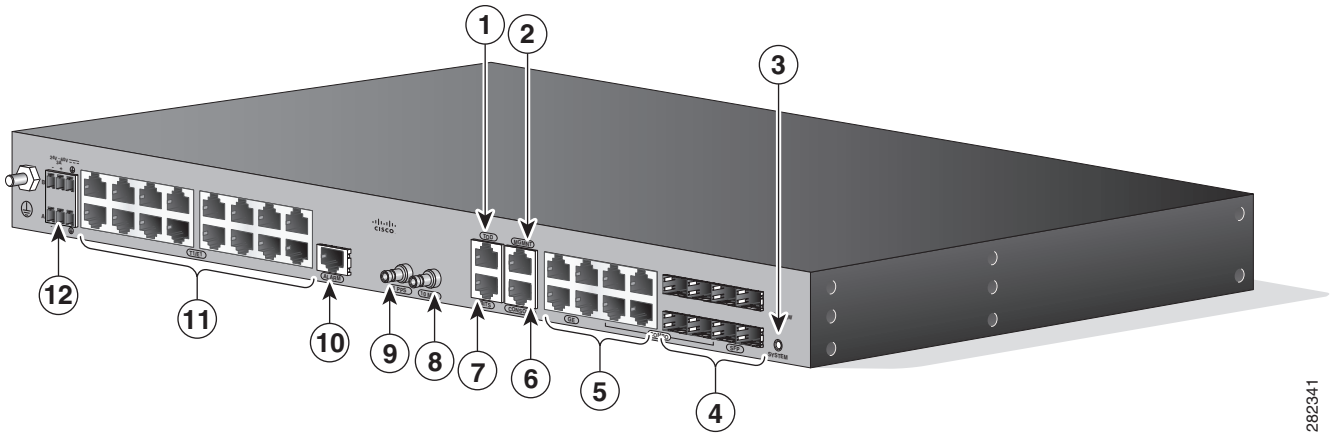
Cisco ASR 901 Router Front View

Figure 1-1 shows the front view of the Cisco ASR 901 router with each interface module.

The front panel of the Cisco ASR 901 router has the following components:

- 16 T1/E1 ports, labelled T1/E1 (positions 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14,15 and 16)
- Eight RJ-45 jacks for copper Ethernet ports, labeled “100/1000” Ethernet.
- Eight SFP connectors for optical GE ports
- Two miniature coaxial connectors for 10MHZ and 1PPS timing
- A single RJ-45 connector for console, labeled “CONSOLE”
- A single RJ-45 jack for the BITS interface, labeled “BITS”
- A single RJ-45 jack for the ToD interface, labeled “ToD”
- A single alarm
- Two management ports
- The following LEDs
  - T1/E1 ports
  - Ethernet ports
  - SFP ports
  - Chassis: Single LED for multiple conditions

Figure 1-1 Cisco ASR 901 Router—Front View



1	ToD Port	**7**	BITS Port
2	Management Port	**8**	MINI-Coax Connector (1PPS)
3	Power LED	**9**	MINI-Coax Connector (10MHZ)
4	8 SFP Ports	**10**	Alarm
5	8 GE Ports	**11**	16 T1/E1 Ports
6	Console Port	**12**	Power Connector

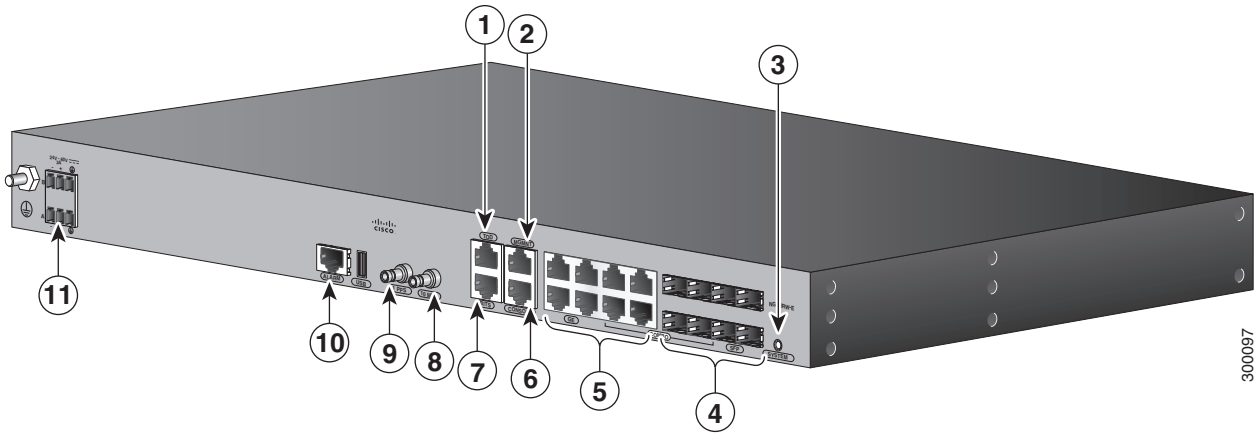
Cisco ASR 901 Router Ethernet Version Front View

Figure 1-2 shows the front view of the Cisco ASR 901 router with each interface module.

The front panel of the Cisco ASR 901 router, ethernet version has the following components:

- Eight RJ-45 jacks for copper Ethernet ports, labeled “100/1000” Ethernet.
- Eight SFP connectors for optical GE ports
- Two miniature coaxial connectors for 10MHZ and 1PPS timing
- A single RJ-45 connector for console, labeled “CONSOLE”
- A single RJ-45 jack for the BITS interface, labeled “BITS”
- A single RJ-45 jack for the ToD interface, labeled “ToD”
- A single alarm
- Two management ports
- The following LEDs
  - Ethernet ports
  - SFP ports
  - Chassis: Single LED for multiple conditions

Figure 1-2 Cisco ASR 901 Router Ethernet Version Front View



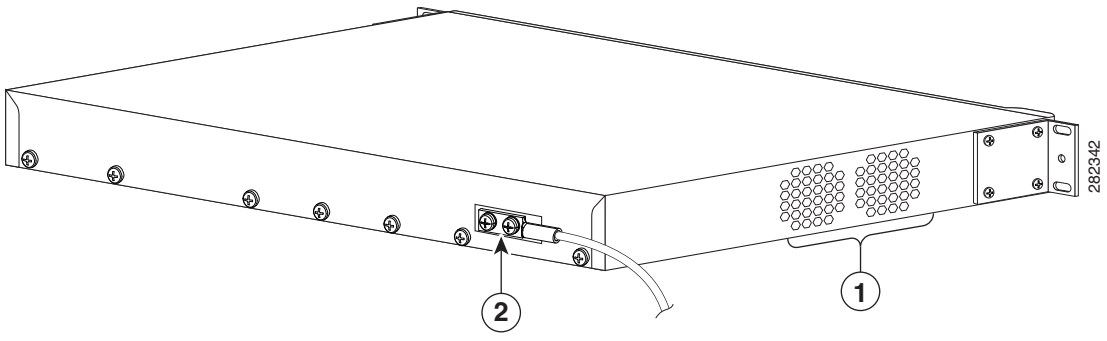
1	ToD Port	**7**	BITS Port
2	Management Port	**8**	MINI-Coax Connector (1PPS)
3	Power LED	**9**	MINI-Coax Connector (10MHZ)
4	8 SFP Ports	**10**	Alarm
5	8 GE Ports	**11**	Power Connector
6	Console Port		

Cisco ASR 901 Router Rear View

Figure 1-3 shows the rear view of the Cisco ASR 901 router including the orientation of the following components:

- Two blowing fans
- Mounting point for the 2-hole lug. For more information, see the Connecting the Chassis Ground and Power, page 3-5

Figure 1-3 Cisco ASR 901 Router—Rear View



1	Fan
2	Grounding Point Lug

LEDs

The Cisco ASR 901 chassis and interface modules contain LEDs to assist in troubleshooting. For more detailed description of the LEDs, see the "Reading the LEDs, page A-4.

Power Supply

The Cisco ASR 901 router is equipped with an internal -27/-72 volts Direct Current (VDC).

Safety Precautions

Observe the following general safety precautions and recommendations in planning the source power requirements for the Cisco ASR 901 router (for additional safety information, see the "Safety Guidelines" section on page 2-1:

- Check the power at your site before router installation (and periodically after installation) to ensure clean power (free of spikes and noise) is being received.
- Always disconnect the power source and unplug the power cable before working on the router.
- Install proper grounding for the site to avoid damage from lightning and power surges.

Warning **To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables.** Statement 1021

Warning **There is the danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.** Statement 1015

Warning **This unit might have more than one power supply connection. All connections must be removed to de-energize the unit.** Statement 1028

Table 1-1 lists the DC power supply specifications for the Cisco ASR 901 router.

Table 1-1 Cisco ASR 901 Router Power Supply Specifications

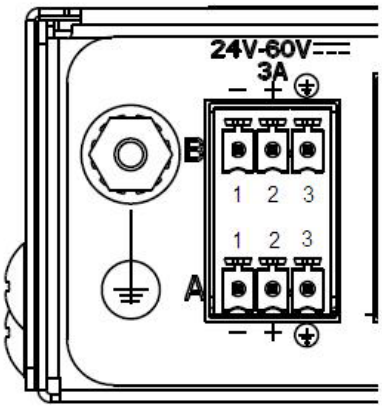
Specification	Value
DC power supply input voltage	-24/-72 VDC
Maximum input current	3 A
Wire gauge for DC input power connections	16 AWG
Power dissipation	60 Watts

The Cisco ASR 901 router uses two 3 pin connectors (part number 27-2030-01) for input to the power supply. The terminal block is part of the accessory kit (part number 53-3085-01/53-3295-0), which ships with the Cisco ASR 901 router.

The ground wire connects to a 2-hole plug, which connects to the corresponding mounting point.

With the connector installed in the chassis, the pins are numbered as 1,2, and 3, respectively.

Figure 1-4 Cisco ASR 901 Router—Power Supply Connector Pinouts



Pin	Connector A
1	VDC (-24 to -72)
2	RTN
3	Chassis Ground

Pin	Connector B
1	VDC (-24 to -72)
2	RTN
3	Chassis Ground

303327

Table 1-2 lists the pinout configurations for the connector, based on the power source.

Table 1-2 Power Supply Connector Pinouts (-24/-72 VDC Application)

Pin	Connector A
1	VDC (-24 to -72)
2	RTN
3	Chassis Ground

Pin	Connector B
1	VDC (-24 to -72)
2	RTN
3	Chassis Ground

You can use connector A or B or both.

Environmental Monitoring Temperature Sensor

The Cisco ASR 901 router has a temperature sensor to detect overtemperature conditions inside the chassis. The overtemperature detection trips at 70°C. This condition is reported to the processor as an interrupt, where the software generates the appropriate alarms. If the router reaches a temperature of 85°C, the power supply cycles itself to prevent the router from exceeding the maximum temperature while being powered up.

System Specifications

Table 1-3 lists the system specifications for the Cisco ASR 901 router.

Table 1-3 Cisco ASR 901 Router System Specifications

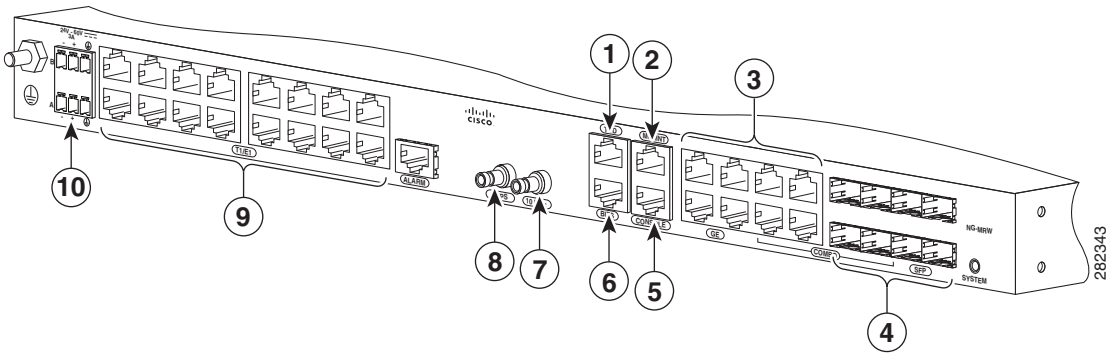
Description	Specification
Dimensions (H x W x D)	1.7 x 17.4 x 8.25 in. (4.37 cm x 44.2 cm x 21.0 cm) 1 RU (rack unit) in a 19-inch (48.3 cm) rack
Weight	3.1 Kgs (7 pounds)
Console and Auxiliary ports	RJ-45 connector
Operating Temperature	Operating temperature range is -40°C to +65°C (-40 to+149°F)
Non-Operational Temperature	Temperature: -40 to 70 degrees C (-40 to 21.1 F)
Operating Humidity	10 to 90% RH (non-condensing)
Non-Operational Humidity	Upto 93% RH
Operating Altitude	13,800 ft. (4206 m)
Operating Vibration	0.15 G, 10 to 500 Hz/100 minutes per axis
Non-Operational Vibration	0.8 G, 10 to 500 Hz/30 minutes per axis
Operating Acoustics	60 db
Air Flow	Side to side

Router Interface Numbering

Each network interface on a Cisco ASR 901 router is identified by a slot number and a port number, explained in this sequence:

- Logical slot numbers starts from 0 for all built-in interfaces. The numbering format is **`Interface type Slot number/Interface number`**. Interface (port) numbers begin at logical 0 for each interface type.
- Logical interface numbering for T1/E1 ports on the TDM interface module runs from 0/0 through 0/15. Ports are numbered bottom to top, left to right.
- Logical interface numbering for the built-in ethernet ports runs from g0/0 through g0/3, the combo ports run from g0/4 to g0/7 and the SFP ports run from g0/8 through g0/11. The GE ports are numbered bottom to top, left to right.

Figure 1-5 Cisco ASR 901 Router Port Numbers



1	ToD Port	**6**	BITS Port
2	Management Port	**7**	MINI-Coax Connector (1PPS)
3	8 SFP Ports	**8**	MINI-Coax Connector (10MHZ)
4	8 GE Ports	**9**	16 T1/E1 Ports
5	Console Port	**10**	Power Connector

Table 1-4 Cisco ASR 901 Router Interface Labels

Interface	Number	Location	Label
RJ45 jacks for copper ethernet ports	8	Onboard	100/1000 ETHERNET
SFP connector for optical GE ports	8	Onboard	Fiber ETHERNET
RJ45 connector for console	1	Onboard	CON/AUX
RJ45 jack for BITS interface	1	Onboard	BITS
RJ45 jack for Time-of-Day interface	1	Onboard	TOD
1PPS mini-coax timing connector	1	Onboard	1PPS
10Mhz mini-coax timing connector	1	Onboard	10MHZ
RJ48 jacks for T1/E1 ports	16	T1/E1 interface module	T1/E1
Power connector	1	Onboard	Power Connector

Regulatory Compliance

For regulatory compliance and safety information, see *Cisco Regulatory Compliance and Safety Information for Cisco ASR 901 Series Aggregation Services Router*.

CHAPTER 2

Preparing to Install the Router

This chapter describes site requirements and equipment used to install the Cisco ASR 901 router. It includes the following sections:

- Safety Guidelines, page 2-1
- Prerequisites, page 2-4
- Site Planning, page 2-4
- Console Port Considerations, page 2-8

Safety Guidelines

Before you begin installing the Cisco ASR 901 router, review the safety guidelines in Safety Precautions, page 1-5, and the Rack-Mounting Configuration Guidelines, page 3-2 to avoid injuries or damaging the equipment.

In addition, before replacing, configuring, or maintaining the Cisco ASR 901 router, review the safety warnings listed in the document Cisco *Regulatory Compliance and Safety Information for Cisco ASR 901 Series Aggregation Services Router*.

Safety with Equipment

The following guidelines help ensure your safety and protect the equipment. This list does not include all the potentially hazardous situations, so be *alert*.

Warning **Before connecting the system to the power source, read the installation instructions.** Statement 1004

- Before moving the system, always disconnect all the power cords and interface cables.
- Never assume that power is disconnected from a circuit; *always* check.
- Before and after installation, keep the chassis area clean and dust-free.
- Keep tools and assembly components away from walk areas to avoid tripping over them.
- Do not work alone in potentially hazardous conditions.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Do not wear loose clothing that may get caught in the chassis.

- When working under conditions hazardous to your eyes, wear safety glasses.

Safety with Electricity

Warning **Before performing any of the following procedures, ensure that power is removed from the DC circuit.** Statement 1003

Warning **This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.** Statement 1017

Warning **To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors.** Statement 1021

Warning **Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.** Statement 43

Warning **Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.** Statement 12

Warning **During periods of lightning activity, do not work on the system or connect or disconnect cables.** Statement 1001

Warning **There is the danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.** Statement 1015

Warning **This unit might have more than one power supply connection. All connections must be removed to de-energize the unit.** Statement 1028

When working on electrical equipment, follow these guidelines:

- Locate the room's emergency power switch. If an electrical accident occurs, you can quickly switch off the power.
- Before working on the system, switch off the DC main circuit breaker and disconnect the power terminal block cable.
- Disconnect all power before performing the following:

  - Working on or near power supplies.
  - Installing or removing a router chassis, or network processor module.
  - Performing most hardware upgrades.
- Never install equipment that appears damaged.
- Carefully examine your work area for possible hazards, such as wet floors, ungrounded power extension cables, and missing safety grounds.
- Never assume that power is disconnected from a circuit; *always* check.
- Never perform any action that creates a potential hazard to people or makes the equipment unsafe.
- If an electrical accident occurs, proceed as follows:
  - Use caution, and do not become a victim yourself.
  - Switch off power to the router.
  - If possible, send another person to get medical aid. Otherwise, determine the condition of the victim, and then call for help.
  - Determine whether the person needs rescue breathing or external cardiac compressions; then take appropriate action.

In addition, use the following guidelines when working with any equipment that is disconnected from a power source, but still connected to telephone wiring or network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for it.
- Never touch un-insulated telephone wires or terminals unless the telephone line is disconnected at the network interface.
- When installing or modifying telephone lines, use caution.

Preventing Electrostatic Discharge Damage

Electrostatic Discharge (ESD) can damage equipment and impair electrical circuitry. ESD can occur when electronic printed circuit cards are improperly handled, and can cause complete or intermittent failures. When removing and replacing modules, always follow ESD prevention procedures:

- Ensure that the router chassis is electrically connected to earth ground.
- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. To channel unwanted ESD voltages safely to ground, connect the clip to an unpainted surface of the chassis frame. To guard against ESD damage and shocks, the wrist strap and cord must operate effectively.
- If no wrist strap is available, ground yourself by touching a metal part of the chassis.

Caution For the safety of your equipment, periodically check the resistance value of the antistatic wrist strap. It should be between 1 and 10 Mohm.

Prerequisites

Before installing the Cisco ASR 901 router, it is important to prepare for installation by:

- Preparing the site (site planning) and reviewing the installation plans or method of procedures (MOPs).
- Unpacking and inspecting the Cisco ASR 901 router.
- Gathering tools and test equipment required to properly install the Cisco ASR 901 router.

Site Planning

Ideally, you should have prepared the installation site beforehand. As part of your preparation, obtain a floor plan of the site and the equipment rack where the Cisco ASR 901 router would be housed. Determine the location of any existing routers and their interconnections, including communications and power. Following the air flow guidelines (see the "Air Flow Guidelines" section on page 2-5), ensure that adequate cooling air is provided to the router.

All personnel involved in the installation of the router including installers, engineers, and supervisors should participate in the preparation of a Method of Procedure (MOP) for approval by the customer.

Power Supply Considerations

Check the power at your site to ensure that you are receiving clean power (free of spikes and noise). Install a power conditioner if necessary (see the Power Supply, page 1-5 for power requirements).

Warning **This equipment is designed for connection to TN and IT power systems.** Statement 16

Site Environment

Install the Cisco ASR 901 router in an equipment rack. The location of your router and the layout of your equipment rack, or wiring room are extremely important considerations for proper operation. Cramped equipment, inadequate ventilation, and inaccessible panels can cause malfunctions and shutdown, and can make maintenance difficult. Plan to access the front and rear panels of the router.

Take the following precautions for an acceptable operating environment for your router and to avoid environmentally caused equipment failures:

- Ensure that the room where your router operates has adequate air circulation. Electrical equipment generates heat. Without adequate circulation, ambient air temperature may not cool the equipment to acceptable operating temperatures.
- Always follow ESD-prevention procedures described in the "Preventing Electrostatic Discharge Damage" section on page 2-3 to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.

Air Flow Guidelines

To ensure adequate air flow through the equipment rack, we recommend that you maintain a clearance of at least 6 inches (15.24 cm) on each side of the rack at all times.

Caution If air flow through the equipment rack and the routers that occupy it is blocked or restricted, or if the ambient air being drawn into the rack is too warm, an over temperature condition can occur within the rack and the routers that occupy it.

The site should also be as dust-free as possible. Dust tends to clog the router fans, reducing the flow of cooling air through the equipment rack and the routers. Thus, increasing the risk of an over temperature condition.

Use the following guidelines to plan your equipment rack configuration:

- Mount the Cisco ASR 901 router in a 19-inch rack (with a 17.5- or 17.75-inch opening).
- Beside air flow, you must allow clearance around the rack for maintenance.
- Enclosed racks must have adequate ventilation. Ensure that the rack is not congested, because each router generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air. Heat that is generated by equipment near the bottom of the rack can be drawn upward into the intake ports of the equipment above.
- When mounting a chassis in an open rack, ensure that the rack frame does not block the intakes or (on the left side of the chassis) or the exhaust (on the right side of the chassis).
- When a rack-installed equipment fails, especially equipment in an enclosed rack, try making the equipment operate by itself, if possible. Power off other equipment in the rack (and in adjacent racks) to give the router a maximum of cooling air and clean power.

Method of Procedure

Part of site preparation includes reviewing installation plans or method of procedures (MOPs). An example of a MOP that includes pre-installation checklist of tasks, considerations to address and agree upon before proceeding with the installation, is as follows:

1. Read this hardware installation guide.
2. Assign personnel.
3. Determine protection requirements for personnel, equipment, and tools.
4. Evaluate potential hazards that may affect service.
5. Schedule time for installation.
6. Determine space requirements.
7. Determine power requirements.
8. Identify required procedures or tests.
9. On an equipment plan, make a preliminary decision that locates each Cisco ASR 901 router that you plan to install.
10. Verify the list of replaceable parts for installation (screws, bolts, washers, and so on) so that the parts are identified.

11. Check the required tools list to make sure the necessary tools and test equipment are available (see the "Required Tools and Equipment" section on page 2-6).
12. Perform the installation.

Unpacking and Checking the Contents of your Shipment

The shipping package for the Cisco ASR 901 router is designed to reduce the possibility of product damage associated with routine handling experienced during shipment. Do not remove the router from its shipping container until you are ready to install it.

Note Do not discard the packaging materials used in shipping your Cisco ASR 901 router. You will need the packaging materials in the future if you move or ship the router.

The Cisco ASR 901 router, cables, and any optional equipment you ordered may be shipped in more than one container. When you unpack the containers, check the packing list to ensure that you receive all of the following items:

- Router
- Accessory kit (part number 53-3085-01/53-3295-0 for the Cisco ASR 901), containing
  - Terminal block (part number 53-3085-01)
  - Two hole lug, 6-AWG ground wire, #10 blue stud (part number 32-0629-01)
  - Two pan-head Phillips screws used to attach the lug to the router, M5.0x10mm
  - Two cable guides (part number 700-01663-01)
  - Two pan-head Phillips screws used to attach the cable guides, M4,0x20mm (part number 48-0654-01)

Note There is no AC power option.

- *Cisco Information Packet* publication

Inspect all items for shipping damage. If an item appears to be damaged, or if you encounter problems installing or configuring your router, contact customer service. The *Cisco Information Packet* provides warranty, service, and support information.

Required Tools and Equipment

You need the following tools and equipment to install and upgrade the router and its components:

Warning **Only trained and qualified personnel should be allowed to install or replace this equipment.** Statement 49

- ESD-preventive cord and wrist strap.
- Number 2 Phillips screwdriver.
- Flat-blade screwdrivers: small, 3/16-inch (0.476 cm) and medium, 1/4-inch (0.625 cm).

  - To install or remove modules
  - To remove the cover, if you are upgrading memory or other components
- Number 12-24 pan-head screws to secure the router to the equipment rack.
- Cables for connection to the WAN and LAN ports (depending on the configuration).

Note For more information on cable specifications, see Appendix B, "Cable Specifications"

- Ethernet hub or PC with a network interface card for connection to the Ethernet (LAN) ports.
- Console terminal (an ASCII terminal or a PC running terminal emulation software) is configured for 9600 baud, 8 data bits, no parity, and 2 stop bits.
- Console cable for connection to the console port.
- Ratcheting torque screwdriver with a Phillips head that exerts up to 15 pound-force inches (lbf-in) of pressure.
- Crimping tool as specified by the ground lug manufacturer.
- 16-AWG copper wire for the power cord.
- Wire-stripping tools for stripping both 6-AWG and 18-AWG wire.
- Serial interfaces may require a channel service unit/data service unit (CSU/DSU).

Installation Checklist

To assist you with your installation and to provide a historical record of completed tasks and users, use the following Installation Checklist. Make a copy of this checklist and mark the entries as you complete each task. When the checklist is completed, include a copy of the checklist for each router in your Site Log along with other records for your new router. See Appendix C, "Site Log" for information on the Site Log, including a sample Site Log.

Installation Checklist for Site:

Router Name:

Task	Verified by	Date
Installation Checklist copied		
Background information placed in Site Log		
Site power voltages verified		
Installation site power check completed		
Required tools available		
Additional equipment available		
Router received		
Documentation DVD received (if ordered)		
Cisco Information Packet publication received		
Chassis components verified		
Initial electrical connections established		

Task	Verified by	Date
ASCII terminal (for local configuration) or modem (for remote configuration)		
Signal distance limits verified		
Startup sequence steps completed		
Initial operation verified		
Software image verified		

Creating a Site Log

The site log provides a record of all actions related to installing and maintaining the router. Keep it in an accessible place near the chassis so that anyone who performs tasks has access to it.

Create the site log prior to installation. (See Appendix C, "Site Log" for more detailed information on the site log as well as a sample site log that can be used to make copies.)

Console Port Considerations

The Cisco ASR 901 router provides a single console port (labeled CONSOLE). A single RJ-45 cable is used for a console connection.

This section describes important cabling information to consider before connecting a console terminal—either an ASCII terminal or a PC running terminal emulation software—or a modem to the console port. The console port provides access to the router either locally (using a console terminal), or remotely (using a modem).

Note The Cisco ASR 901 router uses only console port.

Note Console and rollover cables are not included with the Cisco ASR 901 router. You can order the console cable from Cisco Systems, Inc. (Part number ACS-1900ASYN=).

Console Port Connections

The router provides an EIA/TIA-232 asynchronous serial console port (RJ-45). Depending on the cable and the adapter used, this port appears as a data terminal equipment (DTE) or data communications equipment (DCE) device at the end of the cable.

To connect an ASCII terminal to the console port, use the RJ-45 rollover cable with the female RJ-45-to-DB-25 adapter (labeled TERMINAL). To connect a PC running terminal emulation software to the console port, use the RJ-45 rollover cable with the female RJ-45-to-DB-9 adapter (labeled TERMINAL). The default parameters for the port are 9600 baud, 8 data bits, no parity, and 2 stop bits. As a console port, hardware flow control is not supported. For instructions on installing a console terminal, see the "Connecting the Console Port" section on page 3-11.

For cable and port pinouts, see the online document *Cisco Modular Access Router Cable Specifications.* This document is provided on the documentation DVD that accompanied your router (if ordered), and is also available online at Cisco.com.

CHAPTER 3

Installing the Cisco ASR 901 Mobile Wireless Router

This chapter describes how to install the Cisco ASR 901 router, and how to connect it to networks and external devices. These are the following sections:

- Network Modules, page 3-1
- Mounting the Cisco ASR 901 Router, page 3-2
- Connecting the Chassis Ground and Power, page 3-5
- Installing and Removing SFP Modules, page 3-9
- Connecting Cables, page 3-11
- Powering On the Router, page 3-15

Warning **Only trained and qualified personnel should be allowed to install, replace, or service this equipment.** Statement 1030

Warning **This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.** Statement 1017

Network Modules

You can order the Cisco ASR 901 router with the following interface modules.

- T1/E1 interface module
- SFP Ethernet interface module
- RJ-45 Ethernet interface module

Interface modules are installed and shipped with the router; they are not field replaceable.

Mounting the Cisco ASR 901 Router

Each Cisco ASR 901 router includes rack-mounting brackets. Using the rack-mounting brackets, you can front-mount theCisco ASR 901 router in a 19-inch (48.3-cm) equipment rack that conforms to the EIA-310-D specification (the inside width of the rack should be 17.72 to 17.80 inches [45 to 45.21 cm]).

Using the two rack-mounting brackets for mounting (part number 700-33522-01), you can recess Cisco ASR 901 router in the equipment rack. This arrangement provides extra space in front of the router for the cables and allows you to close the doors of racks equipped with front-close doors.

If you need to attach or replace the rack-mounting brackets, see the "Attaching the Rack-Mounting Brackets" section on page 3-3.

The rack-mounting brackets are slotted to allow the router to be mounted in racks with EIA 1.25-inch (3.175-cm) or WECO 1.0-inch (2.54-cm) hole spacing. When installed in the rack, the Cisco ASR 901 router requires one EIA 1.75-inch (4.4-cm) vertical mounting space (or 1 rack unit [RU]) for mounting (see the "Mounting the Cisco ASR 901 Router in a Rack" section on page 3-3).

Caution Allow clearance on either side of the Cisco ASR 901 router for cooling air to be drawn in through the left side and circulated through the chassis and out the two fan exhaust ports mounted on the other side of the chassis.

Rack-Mounting Configuration Guidelines

Follow these guidelines to configure the equipment rack:

- When mounting the router to an equipment rack, ensure that the rack is bolted to the floor.
- Because you may install more than one router into the rack, ensure that the weight of all of the routers installed does not make the rack unstable.

Caution Some equipment racks are also secured to ceiling brackets, if necessary, due to the weight of the equipment in the rack. Make sure that the rack you are using to install the routers is secured to the building structure.

- As mentioned in the "Air Flow Guidelines" section on page 2-5, maintain a 6-inch (15.24-cm) clearance on each side of the router to ensure adequate air intake and exhaust.
- Avoid installing the routers in an overly congested rack. Air flowing to or from other routers in the rack might interfere with the normal flow of cooling air through the routers, increasing the potential for overtemperature conditions within the routers.
- Allow at least 19 inches (48.7 cm) of clearance at the front and rear of the rack for router maintenance.
- Follow your local practices for cable management. Ensure that cables to and from the routers do not impede access to perform equipment maintenance or upgrades.

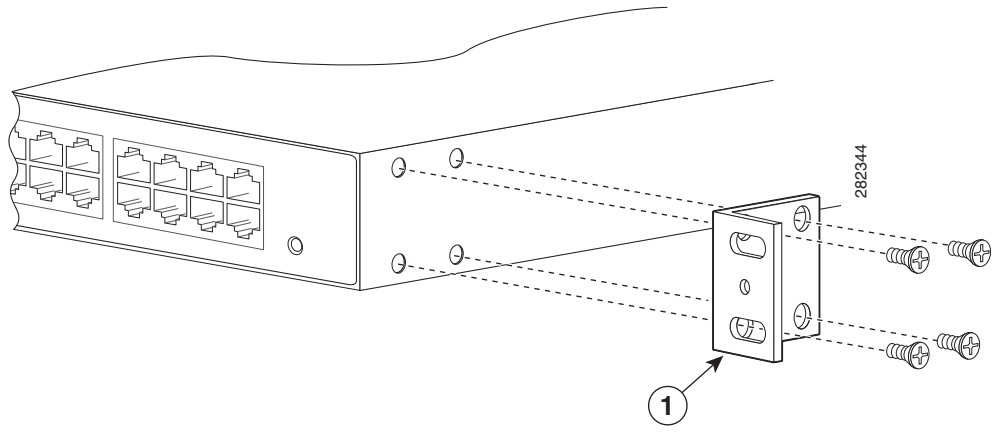
Attaching the Rack-Mounting Brackets

Complete the following tasks to install, replace, or rearrange the rack-mounting brackets so you can then mount the Cisco ASR 901 router in a 19-inch (48.3-cm) equipment rack. You can use the same rack-mounting brackets to front-mount the Cisco ASR 901 router in the equipment rack.

Step 1 Locate the mounting holes of the Cisco ASR 901 router.

Step 2 Align the rack-mounting bracket with the Cisco ASR 901 router and position with the four #6-32 x 0.25-inch screws (provided) (see Figure 3-1 for front-mounting).

Figure 3-1 Attaching the Bracket for Front-Mounting



1	Rack mount bracket

Step 3 Insert the screws (four places) and tighten using a Number 2 Phillips screwdriver.

Step 4 Repeat Steps 2 and 3 for the other rack-mounting bracket.

Proceed to the next section, "Mounting the Cisco ASR 901 Router in a Rack" to continue the installation.

Mounting the Cisco ASR 901 Router in a Rack

Typically, the Cisco ASR 901 router mounts to a 19-inch (48.3-cm) 2-post equipment rack with rack-mounting brackets that attach toward the front of the router sides. The inside width between the two posts or mounting strips (left and right) must be at least 17.72 to 17.80 inches [45 to 45.21 cm]. For more information about the equipment rack, see "Hardware Description" section on page 1-1.

No vertical clearance is necessary above or below the router when it is mounted in the rack.

To secure the Cisco ASR 901 router to the equipment rack, you must use the two mounting screws (provided) for each side or follow your local practices for installing the router into your equipment rack. Ensure that the rack-mount brackets are securely fastened. For more information, see the "Attaching the Rack-Mounting Brackets" section on page 3-3.

To mount the Cisco ASR 901 router into the equipment rack, perform the following procedure.

Caution To prevent injury, review the "Safety Guidelines" section on page 2-1 and the "Rack-Mounting Configuration Guidelines" section on page 3-2 before installing the Cisco ASR 901 router in the equipment rack.

Step 1 Locate the equipment rack position where you plan to install the router.

Step 2 Verify that there are no obstructions and ensure that the equipment rack is stabilized.

Step 3 Position the router in the equipment rack lining up the bracket holes on the router with the holes on the rack and secure with four #6-32 x 0.25-inch mounting screws (two on each side).

Note The vertical spacing for EIA equipment racks is 1.75 inches (4.44 cm), with mounting holes spaced 1.5 inches (3.81 cm) apart.

Step 4 Tighten the screws using a 1/4-inch flat-blade screwdriver (each side).

Attaching the Cable Guides

Complete the following steps to attach the two cable guides to the front of the mounting brackets. This procedure is optional.

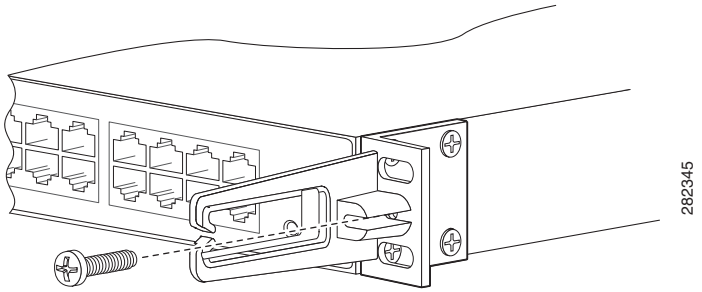
Note The cable guides are useful only if your router is front-mounted. Do not attach the cable guides if your router is center-mounted or recess-mounted.

Use the cable guides to dress the cables that attach to the front of the Cisco ASR 901 router. The cable guides allow you to gather the cables and direct them to the left and right sides of the router. This helps to keep the cables from obscuring the fronts of lower routers in the same rack.

Step 1 In the accessory kit, locate the two cable guides (part number 700-01663-01) and two M4.0x20mm Phillips screws used to attach the cable guides (part number 48-0654-01).

Step 2 Position the cable guide over the threaded hole in the front flange of either the left or right mounting bracket. The threaded hole is located midway between the two slotted holes used to mount the unit to the rack.

Figure 3-2 Attaching the Cable Guide



Step 3 Use an M4.0x20mm Phillips screw to fix the cable guide to the mounting bracket. Do not over-tighten the screw.

Step 4 Repeat Steps 2 and 3 to attach the other cable guide.

Note If you find it awkward to insert the screw while holding the cable guide in place, you can first insert the screw only far enough so that it does not fall out. Then, using the slot in the mounting pillar of the cable guide, slide the cable guide into place around the screw. Finally, tighten the screw to fix the cable guide to the mounting bracket.

Connecting the Chassis Ground and Power

Before you connect power or turn on power to the Cisco ASR 901 router, you must provide an adequate chassis ground (earth) connection to your router.

Grounding the Cisco ASR 901 Router

The Cisco ASR 901 router provides a grounding point on the rear of the unit for a 2-hole lug.

To ensure the chassis ground connection that you provide is adequate, you need the following parts and tools:

- Ratcheting torque screwdriver with Phillips head that exerts up to 15 pound-force inches (lbf-in) of pressure for attaching the ground wire to the router.
- Crimping tool as specified by the ground lug manufacturer
- 16-AWG copper wire for the power cord
- Wire-stripping tools appropriate to the wire you are using

Caution Before making connections to the Cisco ASR 901 router, ensure that you disconnect the power at the circuit breaker. Otherwise it may result in severe injury or damage to the router.

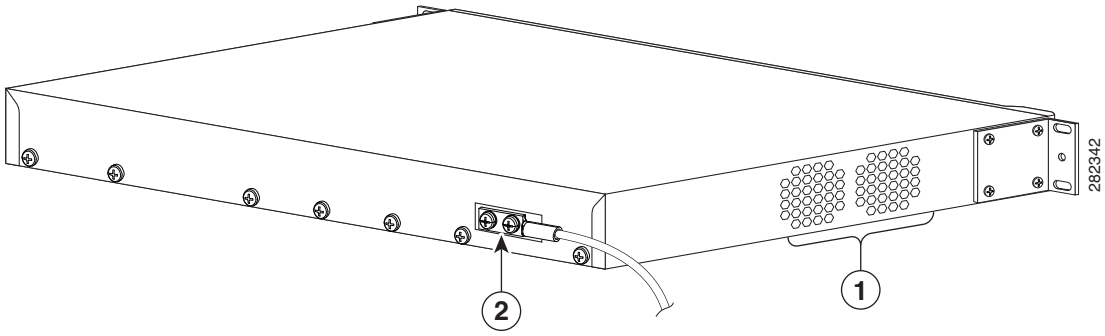
Warning **This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.** Statement 1024

Warning **Use copper conductors only.** Statement 1025

Warning **When installing the unit, the ground connection must always be made first and disconnected last.** Statement 42

Figure 3-3 shows the grounding point marked on the rear panel of the Cisco ASR 901 router for ease of installation

Figure 3-3 Grounding Point



1	Fan
2	Grounding Point Lug

This unit is to be installed in a restrictive access location and must be permanently grounded to minimum 6-AWG copper ground wire.

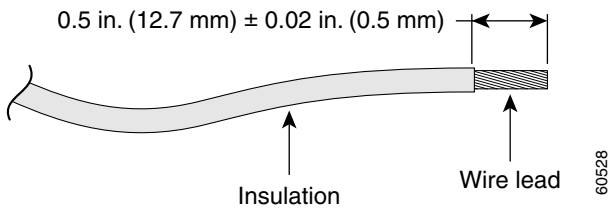
Complete the following steps to ground the Cisco ASR 901 router using a 2-hole lug and the corresponding mounting point. Most carriers require a 6-AWG ground connection. Verify your carrier's requirements for the ground connection.

Step 1 In the accessory kit, locate the 2-hole lug, 2 pan-head Phillips head screws used to attach the lug to the router, and 6-AWG ground wire. (Lug, screws, and wire are part number 32-0629-01.)

Step 2 Set the parts aside.

Step 3 If your ground wire is insulated, use a wire-stripping tool to strip the ground wire to 0.5 inch ± 0.02 inch (12.7 mm ±0.5 mm) for the ring terminal (Figure 3-4).

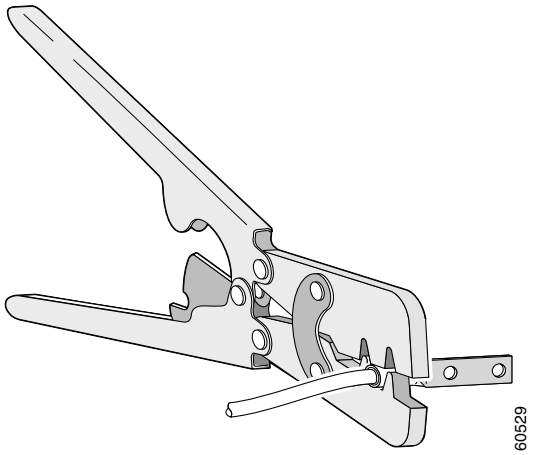
Figure 3-4 Stripping a Ground Wire



Step 4 Slide the open end of your ground lug over the exposed area of the ground wire.

Step 5 Using a crimping tool (as specified by the ground lug manufacturer), crimp the ground lug to the ground wire (Figure 3-5).

Figure 3-5 Crimping a Ground Lug onto the Ground Wire



Step 6 Use a Phillips head screwdriver to attach the ground lug and wire assembly to the front of the router with the 2 screws from the accessory kit.

Step 7 Connect the other end of the ground wire to a suitable grounding point at your site.

Power Connection Compliance

Warning **Before performing any of the following procedures, ensure that power is removed from the DC circuit.** Statement 1003

Warning **Use copper conductors only.** Statement 1025

Note The installation must comply with the 2002 National Electric Code (NEC) and other applicable codes.

Wiring the DC-Input Power Source

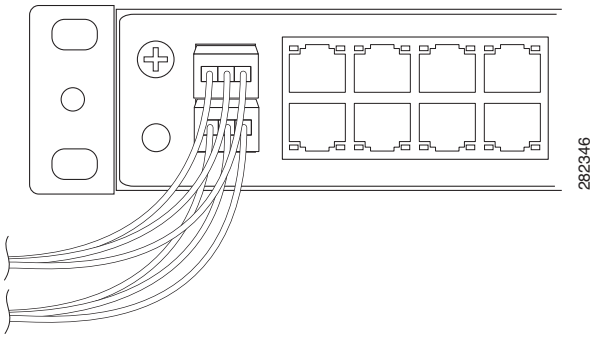
Warning **This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than 10 A minimum, 60 VDC.** Statement 1005

Complete the following steps to connect the DC power supply to the Cisco ASR 901 router:

Step 1 Switch off the DC power source at the circuit breaker, and place the circuit breaker in the Off position.

Step 2 Locate the 6-pin terminal block (part number 27-2030-01) (Figure 3-6). The terminal block is located in the accessory kit (part number 53-3085-01 for the Cisco ASR 901 router), which is shipped with the router.

Figure 3-6 6-Pin Terminal Block



Step 3 Plug the 6-pin terminal block into the power connector located on the front side of the router.

Step 4 Connect one end of the customer-supplied power cord (16-AWG copper wire) to the site DC power source.

Step 5 Plug the connector on the power supply cord into the 6-pin terminal block that you plugged into the rear of the router in Step 3.

Warning **An exposed wire lead from a DC-input power source can conduct harmful levels of electricity. Be sure that no exposed portion of the DC-input power source wire extends from the terminal block plug.** Statement 122

Warning **When installing this unit, secure all power cabling to avoid disturbing field-wiring connections.** Statement 38

Caution *DO NOT* power on the unit yet.

Installing and Removing SFP Modules

This section describes how to install and remove SFP modules. The modules are inserted into the SFP module slots on the front of the Cisco ASR 901 router. These field-replaceable modules provide interfaces.

See the *Release Notes for Cisco ASR 901 Series Aggregation Services Router* for the list of supported SFP modules. Each port must match the wavelength specifications on the other end of the cable. For reliable communications, the cable must not exceed 328 feet (100 meters).

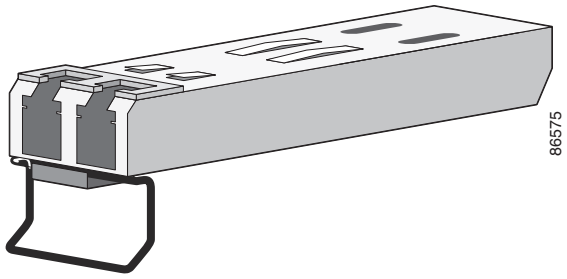
For detailed instructions on installing, removing, and cabling the SFP module, see the SFP module documentation.

Installing SFP Modules

Figure 3-7 shows an SFP module that has a bale-clasp latch.

Caution We strongly recommend that you do not install or remove fiber-optic SFP modules with cables attached because of the potential damage to the cables, the cable connector, or the optical interfaces in the SFP module. Disconnect all cables before removing or installing an SFP module.Removing and installing an SFP module can shorten its useful life. Do not remove and insert SFP modules more often than is absolutely necessary.

Figure 3-7 SFP Module with a Bale-Clasp Latch



Complete the following steps to insert an SFP module into the module slot:

Step 1 Attach an ESD-preventive wrist strap to your wrist and to a bare metal surface on the chassis.

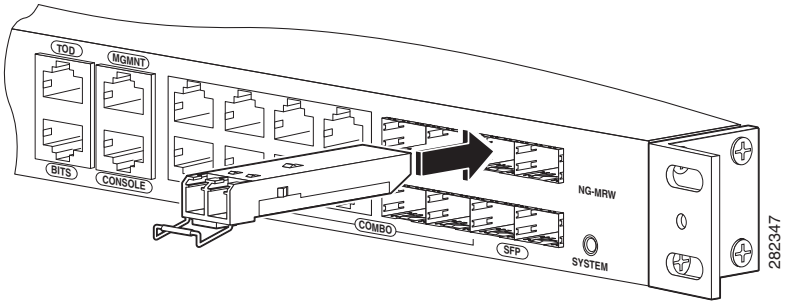
Some SFP modules identify the top side of the module with transmit (TX) and receive (RX) markings or arrows that show the direction of the connection.

Step 2 If the SFP module that you are using has the markings, use them to identify the top side of the module.

Step 3 Align the SFP module in front of the slot opening.

Step 4 Insert the SFP module into the slot until you feel the connector on the module snap into place in the rear of the slot (see Figure 3-8).

Figure 3-8 Installing an SFP Module into an SFP Module Slot



Step 5 For fiber-optic SFP modules, remove the dust plugs from the optical ports, and store them for later use.

Caution Do not remove the dust plugs from the fiber-optic SFP module port or the rubber caps from the fiber-optic cable until you are ready to connect the cable. The plugs and caps protect the SFP module ports and cables from contamination and ambient light.

Step 6 Insert the cable connector into the SFP module:

- For fiber-optic SFP modules, insert the line card or MT-RJ cable connector into the SFP module.
- For copper 1000BASE-T SFP modules, insert the RJ-45 cable connector into the SFP module.

Removing SFP Modules

Complete the following steps to remove an SFP module from a module receptacle:

Step 1 Attach an ESD-preventive wrist strap to your wrist and to a bare metal surface on the chassis.

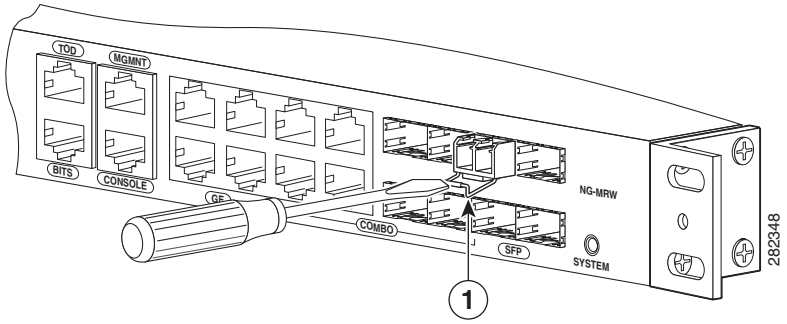
Step 2 Disconnect the cable from the SFP module, and insert a dust plug into the cable end.

Tip For reattachment, note which cable connector plug is transmit (TX) and which is receive (RX).

Step 3 Unlock and remove the SFP module, as shown in Figure 3-9.

If the module has a bale-clasp latch, pull the bale out and down to eject the module. If the bale-clasp latch is obstructed and you cannot use your index finger to open it, use a small, flat-blade screwdriver or other long, narrow instrument to open the bale-clasp latch.

Figure 3-9 Removing a Bale-Clasp Latch SFP Module by Using a Flat-Blade Screwdriver



1	Bale Clasp

Step 4 Grasp the SFP module between your thumb and index finger, and carefully remove it from the module slot.

Step 5 For fiber-optic SFP modules, insert a dust plug into the optical ports of the SFP module to keep the optical interfaces clean.

Step 6 Place the removed SFP module in an antistatic bag or other protective environment.

Connecting Cables

This section describes how to connect the Cisco ASR 901 router to external devices and networks. It includes the following sections:

- Connecting the Console Port, page 3-11
- Connecting the Network Cables, page 3-13
- Dressing Router Cables, page 3-15

Connecting the Console Port

Warning **Do not work on the system or connect or disconnect cables during periods of lightning activity.** Statement 1001

The Cisco ASR 901 router has a single console port that can function in DTE mode:

- DTE-mode console (terminal) port for connecting a console terminal

Note The console port functions are asynchronous serial ports; any devices connected to the console port must be cabled for asynchronous transmission. (Asynchronous is the most common type of serial device; for example, most modems are asynchronous devices.)

The Cisco ASR 901 router uses RJ-45 ports for console port function.

We provide the following cables and adapters for connecting the Cisco ASR 901 router to a console terminal:

- One console adapter cable (RJ-45-to-DB-9, blue)

Types of RJ-45 Cables

Cisco products use the following three types of RJ-45 cables:

- Straight-through
- Crossover
- Rolled (or Rollover)

The Cisco ASR 901 router ships with and uses the rollover cable. For instructions on how to identify a rollover cable, see Identifying a Rollover Cable, page B-5.

Console Port

Complete the following steps to connect a terminal or a PC running terminal emulation software to the console port on the router:

Step 1 Connect the terminal using an RJ-45 rollover cable and an RJ-45-to-DB-25 or RJ-45-to-DB-9 adapter (labeled TERMINAL) to the console port. For cable pinouts, see the "Console Port Signals and Pinouts" section on page B-3.

Note The RJ-45-to-DB-25 adapter (Cisco part number 29-0810-01) can be purchased from Cisco Systems.

Step 2 Configure the terminal or terminal emulation software for 9600 baud, 8 data bits, no parity, and 2 stop bits.

Note Hardware flow control is not possible on the console port.

Connecting the Network Cables

This section describes how to connect the following router interfaces:

- Connecting Gigabit Ethernet Interface Cables, page 3-13
- Connecting T1 and E1 Interface Cables, page 3-13
- Connecting SFP Cables, page 3-14
- Connecting Cables to the BITS Interface, page 3-14
- Connecting GPS Cables, page 3-14
- Connecting GPS Cables, page 3-14
- Connecting to the Management Ethernet Port, page 3-15

Connecting Gigabit Ethernet Interface Cables

The RJ-45 port supports standard straight-through and crossover Category 5 unshielded twisted-pair (UTP) cables. Cisco Systems does not supply Category 5 UTP cables; these cables are available commercially.

Complete the following steps to connect the cable to the router Gigabit Ethernet port:

Step 1 Confirm that the router is powered off.

Step 2 Connect one end of the cable to the GE port on the router.

Step 3 Connect the other end to the BTS patch or demarcation panel at your site.

For more information about Gigabit Ethernet connectors including pinouts, see "Gigabit Ethernet Connector Pinouts" section on page B-1

Connecting T1 and E1 Interface Cables

Complete the following steps to connect the cable to a router T1/E1 port:

Note You must close the relays on the card using the standalone subcommand. For more information, see the Cisco ASR 901 Mobile Wireless Router Software Configuration Guide.

Step 1 Confirm that the router is powered off.

Step 2 Connect one end of the cable to the T1 or E1 (RJ-48C) port. Use a T1/E1 cable.

Step 3 Connect the other end to the BTS patch or demarcation panel at your site.

Step 4 Turn on power to the router (see "Powering On the Router" section on page 3-15 for more details).

For more information about T1/E1 connectors including pinouts, see "T1/E1 Port Pinouts" section on page B-2.

Connecting SFP Cables

Complete these steps to connect the cable to a router SFP port.

Step 1 Confirm that the router is powered off.

Step 2 Insert the SFP module patch cable into the slot until you feel the connector on the cable snap into place in the rear of the slot.

Step 3 Connect the other end to the patch or demarcation panel at your site.

Step 4 Turn on power to the router (see "Powering On the Router" section on page 3-15 for more details).

For more information about SFP connectors, see "SFP Port Pinouts and Cable Specifications" section on page B-2.

Connecting Cables to the BITS Interface

Complete these steps to connect the cable to the router BITS port:

Step 1 Confirm that the router is powered off.

Step 2 Connect one end of the cable to the BITS port using a T1/E1 cable.

Step 3 Connect the other end to the SETS unit.

Step 4 Turn on power to the router (see "Powering On the Router" section on page 3-15 for more details).

For more information about T1/E1 connectors including pinouts, see "BITS Port Pinouts" section on page B-6.

Connecting GPS Cables

The following sections describe how to connect cables from the Cisco ASR 901 router to a GPS unit for input or output timing or frequency.

- Connecting Cables to the 10Mhz or 1PPS Interface
- Connecting Cables to the ToD Interface

Connecting Cables to the 10Mhz or 1PPS Interface

Complete these steps to connect cables to the 10Mhz or 1PPS interface:

Step 1 Confirm that the router is powered off.

Step 2 Connect one end of a mini-coax cable to the GPS unit.

Step 3 Connect the other end of the mini-coax cable to the 10Mhz or 1PPS port on the Cisco ASR 901 router.

For instructions on how to configure clocking, see the Cisco ASR 901 *Mobile Wireless Router Software Configuration Guide.*

For more information about 10Mhz and 1PPS port pinouts, see "GPS Port Pinouts" section on page B-6.

Connecting Cables to the ToD Interface

Complete these steps to connect cables to the ToD interface for GPS timing.

Step 1 Confirm that the router is powered off.

Step 2 Connect one end of a straight-through Ethernet cable to the GPS unit.

Step 3 Connect the other end of the cable to the ToD port on the Cisco ASR 901 router.

For instructions on how to configure clocking, see the *Cisco ASR 901 Router Software Configuration Guide.*

Note For more information about BITS port pinouts, see "Time of Day Pinouts" section on page B-6.

Connecting to Alarm Port

Use a straight cable to connect to the alarm port. For details on the pinouts, see "Alarm Port Pinouts" section on page B-7.

Connecting to the Management Ethernet Port

Use a straight or a cross over ethernet cable to connect to the management ethernet port. For details on the pinouts, see "Management Ethernet Port Pinouts" section on page B-7.

Dressing Router Cables

Ensure all Cisco router cables are properly dressed so as not to interfere with each other or other pieces of equipment. Use local practices to ensure that the cables attached to your router are properly dressed.

Note If your Cisco ASR 901 router is front-mounted, you can use the cable guide (found in the accessory kit) to dress the cables.

To continue the installation, proceed to the next section, "Powering On the Router."

Powering On the Router

Warning **Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is off and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected.** Statement 4

Warning **This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.** Statement 39

Checklist for Power Up

Complete these steps to power on the Cisco ASR 901 router:

- Securely mount the router.
- Properly connect the power, network, and interface cables.

Interpreting Front-Panel LEDs

The Cisco ASR 901 router provides a number of LEDs on the front panel to monitor conditions and to aid in troubleshooting problems. For a description of the LEDs, see the "Reading the LEDs" section on page A-4.

Power-On Procedure

Complete these steps to power on the Cisco ASR 901 router and verify its initialization and self-test:

Step 1 Remove the tape from the circuit breaker switch handle.

Step 2 Restore power by moving the handle of the circuit breaker to the ON position.

The LED (labeled POWER) on the front panel should go ON and the fans operate.

Depending on your installation, other front-panel LEDs can also come on.

Note If you encounter problems when you power on the router, see Appendix A, "Troubleshooting".

Formatting Procedures for Flash Memory

We recommend that you erase (Class B) to initialize with a Class B Flash file system.

The Class B Flash file system is also known as the low end file system (LEFS).

Formatting Flash Memory as a DOS File System

To format the flash memory, or to remove the files from it, use the **erase flash:** command.

The following is sample output for formatting the flash memory, formatted with a Class B flash file system:

```
R#erase flash:
Erasing the flash filesystem will remove all files! Continue? [confirm]
Erasing device
```

```
eeee
```

Deleting Files from the Flash Memory

To delete a file from the flash memory, use the **delete:** *filename* command followed by the squeeze flash: command.

When a file is deleted in the Class B Flash file system, the memory space occupied by the deleted file is not released until you use the squeeze command. Although the memory space once occupied by the deleted file remains, the deleted file cannot be recovered. To release the memory space occupied by a deleted file, enter the squeeze flash: command

The following is sample output for deleting a Cisco IOS file from the flash memory, and releasing the memory space originally occupied by the file.

```
Router#dir
Directory of flash:/
    1 -rw- 30564420 <no date> ngmwr-advipservicesk9-mz
    2 -rw- 30564420 <no date> ngmwr-backup
83623932 bytes total (22494964 bytes free)


Router#delete ngmwr-advipservicesk9-mz
Delete filename [ngmwr-advipservicesk9-mz]?
Delete flash:ngmwr-advipservicesk9-mz? [confirm]


Router#show flash:
les_flash_info : 1006 :


System flash directory:
File Length Name/status
    1 30564420 ngmwr-advipservicesk9-mz [deleted]
    2 30564420 ngmwr-backup
[61128968 bytes used, 22494964 available, 83623932 total]
81920K bytes of processor board System flash (Read/Write)


Router#squeeze flash:
Squeeze operation may take a while. Continue? [confirm]
squeeze in progress...
eeee
```

```
Router# more flash:ngmwr-advipservicesk9-mz


00000000: 7F454C46 01020100 00000000 00000000 .ELF .... .... ....
00000010: 00020061 00000001 80008000 00000034 ...a .... .... ...4
00000020: 00000054 20000001 00340020 00010028 ...T ... .4. ...(
00000030: 00050008 00000001 0000011C 80008000 .... .... .... ....
00000040: 80008000 00628A44 00650EEC 00000007 .... .b.D .e.l ....
00000050: 0000011C 0000001B 00000001 00000006 .... .... .... ....
00000060: 80008000 0000011C 00004000 00000000 .... .... ..@. ....
00000070: 00000000 00000008 00000000 00000021 .... .... .... ...!
00000080: 00000001 00000002 8000C000 0000411C .... .... ..@. ..A.
00000090: 00000700 00000000 00000000 00000004 .... .... .... ....
000000A0: 00000000 00000029 00000001 00000003 .... ...) .... ....
000000B0: 8000C700 0000481C 00000380 00000000 ..G. ..H. .... ....
000000C0: 00000000 00000004 00000000 0000002F .... .... .... .../
000000D0: 00000001 10000003 8000CA80 00004B9C .... .... ..J. ..K.
000000E0: 00000020 00000000 00000000 00000008 ... .... .... ....
000000F0: 00000000 0000002F 00000001 10000003 .... .../ .... ....
00000100: 8000CAA0 00004BBC 00623FA4 00000000 ..J ..K< .b?$ ....
00000110: 00000000 00000008 00000000 3C1C8001 .... .... .... <...
00000120: 679C4A80 3C018001 AC3DC70C 3C018001 g.J. <... ,=G. <...
00000130: AC3FC710 3C018001 AC24C714 3C018001 ,?G. <... ,$G. <...
00000140: AC25C718 3C018001 AC26C71C 3C018001 ,%G. <... ,&G. <...
00000150: AC27C720 3C018001 AC30C724 3C018001 ,'G <... ,0G$ <...
00000160: AC31C728 3C018001 AC32C72C 3C018001 ,1G( <... ,2G, <...
--More-- q
```

Enter a Directory and Determine the Current Directory

To enter a directory in the flash memory, use the **cd flash:**/*directory-name* command. To determine which directory you are in, use the **pwd** command.

The following example shows output for the following actions:

- Entering the home directory of a flash memory card (flash:/)
- Verifying that you are in the flash:/ directory

```
Router# cd flash:

Router# pwd

flash:/
```

What to Do After Installing the Hardware

After you install the router hardware, refer to the *Cisco ASR 901 Series Aggregation Services Router Software Configuration Guide* for the software configuration information.

APPENDIX A

Troubleshooting

The Cisco ASR 901 router undergoes extensive testing before it leaves the factory. If you encounter problems, use the information in this appendix to help isolate problems or to eliminate the router as the source of the problem.

This appendix contains the following sections:

- Problem Solving, page A-1
- Reading the LEDs, page A-4

If you cannot locate the source of the problem, contact a customer service representative for information on how to proceed. For technical support information, see the *Cisco Information Packet* publication that shipped with your router. Before you call, have the following information ready:

- Chassis type and serial number
- Maintenance agreement or warranty information
- Type of software and version number
- Date you received the new chassis
- Brief description of the problem
- Brief explanation of the steps you took to isolate the problem

Note Ensure you provide the customer service representative with any upgrade or maintenance information that was performed on the Cisco ASR 901 router after your initial installation (see Appendix C, "Site Log" for Site Log information.)

Problem Solving

To solve a problem, isolate the problem to a specific subsystem by comparing the current router activity to the expected router activity.

The LEDs on the front panel of the router enable you to determine router performance and operation. For a description of these LEDs, see "Reading the LEDs" section on page A-4.

When solving a problem, check the following router subsystems:

- Power and cooling systems—External power source, power cable, router power supply and circuit breaker, and router fans. Also check for inadequate ventilation or air circulation.
- Modules—Checking the LEDs on the modules can help you to identify a failure.

- Cables—Ensure that the external cables connecting the router to the network are all secure.

Troubleshooting the Power and Cooling Systems

See Table A-1 for information to help you isolate the problem.

Table A-1 Troubleshooting the Power and Cooling Systems

Symptom	Possible Cause	Corrective Action
The power (labeled PWR) LED on the front panel is not on.	The power source is not connected properly.	Check the DC input. Check the DC source.
The router shut down after being on for only a short time.	The cause is environmental.	Check for an environmentally induced shutdown. (See "Environmental Reporting Features" section on page A-2).
	The fans do not work; the router overheats and shuts down.	Check the fans.
	The chassis intake and exhaust vents are obstructed.	Check the chassis intake and exhaust vents for obstructions. Clear any obstructions.
	Installation does not meet environmental site requirements.	Check the environmental site requirements in the "System Specifications" on page -7.
The router partially boots, but the LEDs do not light.	There is a possible power supply failure.	Check the power LED on the front panel of the router. If the LED is on, the power supply is functional. If the LED is off, refer to the *Cisco Information Packet* for warranty information or contact customer service.

Environmental Reporting Features

The Cisco ASR 901 router has a temperature sensor to detect over temperature conditions inside the chassis. The over temperature detection triggers an alert at 70°C. This condition is reported to the processor as an interrupt, where software takes action to generate the appropriate alarms. If the router reaches a temperature of 85°C, the power supply will cycle to prevent the router from exceeding that temperature while being powered up state. See Table A-2 for help in interpreting environmental reporting features.

Table A-2 Interpreting Environmental Reporting Features

Symptom	Possible Cause	Corrective Action
The router operates at an abnormally high temperature. The following message appears on the console screen: `%SYS-1-OVERTEMP: System detected OVERTEMPERATURE condition. Please resolve cooling problem immediately!`	There is a fan failure. There is an air conditioner failure in the room. The air flow to cooling vents is blocked.	Take corrective steps. For information about environmental operating conditions, see the System Specifications, page 1-7).

Troubleshooting Cables, and Connections

Network problems can be caused by a cable or cable connection, or external device such as a modem, transceiver, hub, wall jack, WAN interface, or terminal. See Table A-3 for information to help you isolate the problem.

Table A-3 Troubleshooting Cables, and Connections

Symptom	Possible Cause	Corrective Action
The router is experiencing network problems.	The router does not boot properly. The router constantly or intermittently reboots.	Check the router chassis or software. For warranty information, refer to the *Cisco Information Packet* publication that shipped with your router or contact customer service.
	The router boots, but the console screen is frozen.	Verify that the parameters for your terminal are set as follows: (a) The terminal should have the same data rate as the router (9600 bps is the default). (b) 8 data bits. (c) No parity generated or checked. (d) 2 stop bits.
	The router powers on and boots only when a particular cable is disconnected.	There may be a problem with the module or cable. For warranty information, refer to the *Cisco Information Packet* publication that shipped with your order or contact customer service.

Reading the LEDs

The following sections describe the LEDs on the Cisco ASR 901 router.

- Chassis LEDs
- T1/E1 Interface LEDs

Chassis LEDs

Table A-4 summarizes the LEDs on the chassis of the Cisco ASR 901 router. These LEDs are common to all versions of the Cisco ASR 901 router.

Table A-4 LED Summary

Copper GE ports (from GE/FE Quad PHY) contain will have Two LEDS each			
RJ-45 Link	Solid Green	PHY	Link with no activity
L	FLASH Green		Link with activity
	Off		No link
RJ-45 Speed	Green	PHY	Speed 1000
S	Off		off
T1/E1 ports contain Two LEDs each			
Alarm	Off	WP2	Not configured
AL	Yellow		Alarm Condition
Active	Off	WP2	Out of Service / Not configured
C	Green		Carrier Condition (all-ok)
Copper GE (from Quad combo PHY) ports contain Two LEDS each.			
RJ-45 Link	Solid Green	PHY	Link with no activity
L	FLASH Green		Link with activity
	Off		No link
RJ-45 Speed	Green	PHY	Speed 1000
S	Off		off
System LED			
System	Off	HP	No power or unit not boot-up
	Alternating Green/Off		POST in progress
	Solid Green		System Healthy (normal operation)
	Solid Red		System Faulty
SFP LED			
SFP Link-Active	Orange	HP	Link and Active Indicator
L-A	Off		Not Enabled

T1/E1 Interface LEDs

Table A-5 summarizes the LEDs on the T1/E1 interface (available only for A901-12C-FT-D and A901-4C-FT-D).

Table A-5 T1/E1 Port LEDs

LED	Color/State	Description (two LEDs for each T1/E1 port)
Active (labeled C, left LED)	Green	Carrier condition—operating without problem
	Yellow	Loop condition
	Off	Out of service or not configured
Alarm (labeled AL, right LED)	Yellow	Alarm condition
	Off	No alarm

SFP Ethernet Interface LEDs

Table A-6 gives information about the LEDs on the SFP interface.

Table A-6 SFP LEDs

LED	Color/State	Description
SFP Link/Active (labeled LINK ACT)	Orange	Link and active indicator
	Off	Link not enabled

RJ-45 Ethernet Interface LEDs

Table A-7 summarizes the LEDs on the RJ-45 Ethernet interface.

Table A-7 100/1000 Ethernet Port LEDs

LED	Color/State	Description (two LEDs for each 100/1000 Ethernet port)
100/1000 RJ-45 link (labeled L, left LED)	Solid Green	Link with no activity
	Flash Green	Link with activity
	Off	No link detected
100/1000 RJ-45 speed (labeled S, right LED)	Green	Speed 1000
	Yellow	Speed 100
	Off	Off

APPENDIX B

Cable Specifications

If you prefer to build your own cables, this appendix provides cable specifications for the Cisco ASR 901 router.

This appendix includes the following sections:

- Gigabit Ethernet Connector Pinouts, page B-1
- SFP Port Pinouts and Cable Specifications, page B-2
- T1/E1 Port Pinouts, page B-2
- Console Port Signals and Pinouts, page B-3
- BITS Port Pinouts, page B-6
- Time of Day Pinouts, page B-6
- GPS Port Pinouts, page B-6
- Alarm Port Pinouts, page B-7
- Management Ethernet Port Pinouts, page B-7

Gigabit Ethernet Connector Pinouts

This section illustrates the Gigabit Ethernet RJ-45 connector and lists its pinout and signal descriptions. Note that the RJ-45 ports are capable of operating in both 100BaseT and 1000BaseT modes.

Figure B-1 shows the RJ-45 connector and port, and Table B-1 lists the connector pinouts and signals.

Figure B-1 RJ-45 Connector and Port

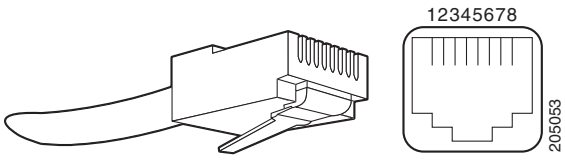


Table B-1 RJ-45 Connector Pinouts

Pin	FE Signal	GE Signal
1	TX data+	TX A+
2	TX data–	TX A–

Table B-1 RJ-45 Connector Pinouts

Pin	FE Signal	GE Signal
3	RX data+	RX B+
4	Not used	TX C+
5	Not used	TX C–
6	RX data–	RX B–
7	Not used	RX D+
8	Not used	RX D–

SFP Port Pinouts and Cable Specifications

For information about SFP modules supported by the Cisco ASR 901 router, including pinouts, see the Cisco Interfaces and Modules support section on Cisco.com.

Note Pins not listed in the tables in this appendix are not connected

T1/E1 Port Pinouts

Figure B-2 shows the RJ-48C connector used by the T1/E1 ports on the TDM interface module on the Cisco ASR 901 router.

Figure B-2 RJ-48C Connector

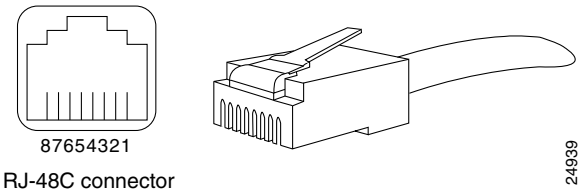
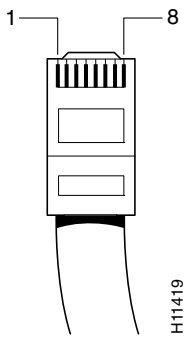


Figure B-3 shows the RJ-48C connector wiring for the T1/E1 cable.

Figure B-3 RJ-48-to-RJ-48 T1/E1 Cable Wiring



Note We recommend using a shielded cable for RJ-48C connectors.

Table B-2 shows the pinout configuration for the RJ-48C connectors on the Cisco ASR 901 router for both the shielded and unsaddled cables for either T1 or E1. Table B-2 shows the pinout configuration for the RJ-45 connectors on the TDM interface module on the Cisco ASR 901 router.

Table B-2 T1/E1 Port Pinout for the Cisco ASR 901 router

Pin	Signal Name	Direction	Description
1	RX Tip	Input	Receive Tip
2	RX Ring	Input	Receive Ring
3			Not used
4	TX Tip	Output	Transmit Tip
5	TX Ring	Output	Transmit Ring
6			Not used
7			Not used
8			Not used

Console Port Signals and Pinouts

The Cisco ASR 901 router ships with a console cable kit, which contains the cable and adapters to connect a console terminal (an ASCII terminal or PC running terminal emulation software). The console cable kit includes the following items:

- RJ-45-to-RJ-45 rollover cable
- RJ-45-to-DB-9 female DTE adapter (labeled TERMINAL)
- RJ-45-to-DB-25 female DTE adapter (labeled TERMINAL)

To connect a modem, you need to order an auxiliary cable.

For console connections, see the "Console Port Signals and Pinouts" section on page B-3.

Console Port Signals and Pinouts

Use the thin, flat, RJ-45-to-RJ-45 rollover cable and the RJ-45-to-DB-9 female DTE adapter (labeled TERMINAL) to connect the console port to a PC running terminal emulation software. Figure B-4 shows how to connect the console port to a PC. Table B-4 lists the pinouts for the asynchronous serial console port, the RJ-45-to-RJ-45 rollover cable, and the RJ-45-to-DB-9 female DTE adapter (labeled TERMINAL).

Figure B-4 Connecting the Console Port to a PC

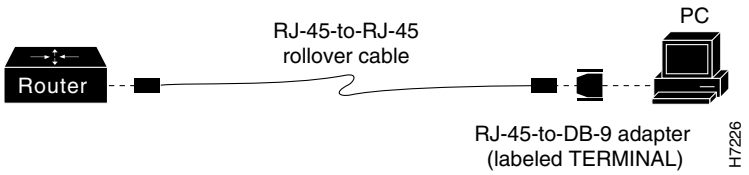


Table B-3 lists the Console port pinouts for the Cisco ASR 901 router.

Table B-3 Console Port Pinouts

Pin	Signal Name	HP Pins	Direction	Description
1	RTS	UART_RTS1	Output	Request to send
2	DTR	NC		
3	TXD	UART_SOUT1	Output	Transmit data
4	RI	GND		Ring indicator
5	GND	GND		
6	RXD	UART_SIN1	Input	Receive data
7	DSR/DCD	NC	Input	Data set ready/Data Carrier detect
8	CTS	UART_CTS1	Input	Clear to send

Table B-4 describes the pinouts RJ-45-to-RJ-45 and RJ-45-to-DB-9 rollover cables.

Table B-4 Console Port Signaling and Cabling Using a DB-9 Adapter

Console Port (DTE)	RJ-45-to-RJ-45 Rollover Cable		RJ-45-to-DB-9 Terminal Adapter (Connected to Rollover Cable)	Console Device
Signal	**RJ-45 Pin**	**RJ-45 Pin**	**DB-9 Pin**	**Signal**
RTS	1[1]	8	8	CTS
DTR	2	7	6	DSR/DCD
TxD	3	6	2	RxD
GND/RI	4	5	5	GND
GND	5	4	5	GND/RI
RxD	6	3	3	TxD
DSR/DCD	7	2	4	DTR
CTS	8[1]	1	7	RTS

1. Pin 1 is connected internally to pin 8.

Table B-5 lists the pinouts for the asynchronous serial console port, the RJ-45-to-RJ-45 rollover cable, and the RJ-45-to-DB-25 female DTE adapter (labeled TERMINAL).

Table B-5 Console Port Signaling and Cabling Using a DB-25 Adapter

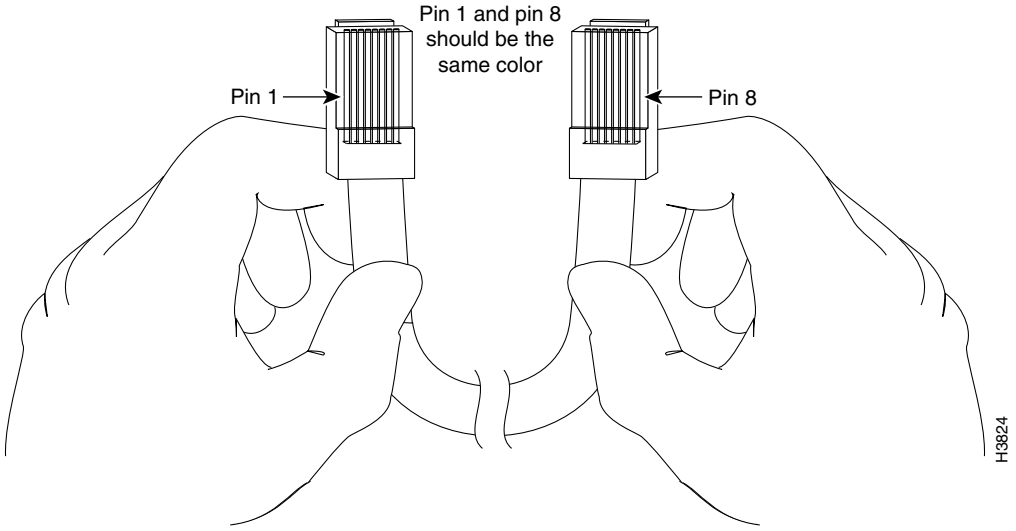
Console Port (DTE)[1]	RJ-45-to-RJ-45 Rollover Cable		RJ-45-to-DB-25 Terminal Adapter	Console Device
Signal	**RJ-45 Pin**	**RJ-45 Pin**	**DB-25 Pin**	**Signal**
RTS	1[2]	8	5	CTS
DTR	2	7	6	DSR/DCD
TxD	3	6	3	RxD
GND/RI	4	5	7	GND
GND	5	4	7	GND/RI
RxD	6	3	2	TxD
DSR/DCD	7	2	20	DTR
CTS	8[2]	1	4	RTS

1. You can use the same cabling to connect a console to the auxiliary port.
2. Pin 1 is connected internally to pin 8.

Identifying a Rollover Cable

To identify a rollover cable, compare the modular plugs at the two ends of the cable. When you hold the plugs side by side, with the tab at the back, the wire connected to the pin on the outside of the left plug should be the same color as the wire connected to the pin on the outside of the right plug (Figure B-5.) If you purchased your cable from Cisco Systems, pin 1 is white on one connector, and pin 8 is white on the other (a rollover cable connects pins 1 and 8, 2 and 7, 3 and 6, and 4 and 5).

Figure B-5 Identifying a Rollover Cable



BITS Port Pinouts

Table B-6 list the pinouts for the BITS interface RJ-45 port on the Cisco ASR 901 router.

Table B-6 BITS Pinouts for the Cisco ASR 901 router

Pin	Signal Name	Direction	Description
1	RX ring	Input	Receive ring
2	RX tip	Input	Receive tip (T1/E1)
3	Not connected		
4	TX ring	Output	Transmit ring
5	TX tip	Output/input	Transmit tip (T1/E1)
6			Not connected
7			Not connected
8			Not connected

Time of Day Pinouts

Table B-6 list the pinouts for the Time of Day RJ-45 interface on the Cisco ASR 901 router.

Table B-7 Time of Day RJ45 Interface Pinout

Pin	Signal Name	Direction	Description
1			Not connected
2			Not connected
3			Not connected
4	Ground		
5	Ground		
6			Not connected
7	TOD_N	Output/Input	Time of Day RS422 differential input or output
8	TOD_P	Output/Input	Time of Day RS422 differential input or output

GPS Port Pinouts

The Cisco ASR 901 router has a 10Mhz and a 1PPS GPS port that allow you to configure input or output clocking with a GPS device. Table B-8 summarizes the pinouts for the 10Mhz and 1PPS interfaces.

Note For pinouts related to ToD and 1PPS using the BITS interface, see Console Port Signals and Pinouts.

Table B-8 GPS Port Pinouts for the Cisco ASR 901 router

	10 Mhz	1PPS
Waveform	Input—Sine wave Output—Square wave	Input—Pulse shape Output—Pulse shape
Amplitude	Input— > 1.7 volt p-p (+8 to +10 dBm) Output— > 2.4 volts TTL compatible	Input— > 2.4 volts TTL compatible Output— > 2.4 volts TTL compatible
Impedance	50 ohms	50 ohms
Pulse Width	50% duty cycle	26 microseconds
Rise Time	Input—AC coupled Output—5 nanoseconds	40 nanoseconds

The 1PPS interface type is Series 1.0 / 2.3, 50 ohms.

For instructions on how to configure the 10 Mhz and 1PPSs ports, see the *Cisco ASR 901 router Mobile Wireless Software Configuration Guide*.

Alarm Port Pinouts

Table B-9 list the pinouts for the alarm port (RJ45) on the Cisco ASR 901 router.

Table B-9 Alarm port Pinout

Pin	Signal Name	Description
1	Alarm input 1	
2	Alarm input 2	
3		Not connected
4	Alarm input 3	
5	Alarm input 4	
6		Not connected
7		Not connected
8		Not connected

Management Ethernet Port Pinouts

Table B-10 list the pinouts for the management ethernet port (RJ45) on the Cisco ASR 901 router.

Table B-10 Management Ethernet Pinout

Pin	Signal Name	Description
1	RxD_P	
2	RxD_N	
3	TxD_P	
4		Not connected
5		Not connected
6	TxD_N	
7		Not connected
8		Not connected

APPENDIX C

Site Log

Use the Site Log to provide a record of actions related to installing and maintaining the router. Keep it in an accessible place near the chassis so that users performing tasks have access to it. Use the Installation Checklist (see the "Installation Checklist" section on page 2-7) to verify the steps in the installation and maintenance of your router. Site Log entries might include the following:

- Installation progress—Make a copy of the Cisco ASR 901 Installation Checklist, and insert it into the Site Log. Make entries as you complete each task.
- Upgrade, removal, and maintenance procedures—Use the Site Log as a record of ongoing router maintenance and expansion history. Each time a task is performed on the Cisco ASR 901 router, update the site log to reflect the following:
  - Removal or replacement of interface modules
  - Configuration changes
  - Maintenance schedules and requirements
  - Maintenance procedures performed
  - Intermittent problems
  - Comments and notes

Table C-1 on page C-2 shows a sample site log. Make copies of the sample or design your own site log to meet the needs of your site and equipment.

Table C-1 Site Log

Date	Description of Action Performed or Symptom Observed	Initials

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